WHAT IS CLAIMED IS:

1. An optical switching matrix comprising:

a plurality of inputs;

a plurality of outputs, wherein at least one input intersects with at least one output;

a plurality of path switches with a path switch at each intersection between an input and an output operable to communicate data from the intersecting input to the intersecting output, wherein the plurality of path switches is configurable to create a plurality of unique paths through the optical switching matrix.

2. The optical switch matrix of Claim 1, wherein each path switch is associated with a switching element.

3. The optical switch matrix of Claim 2, wherein each switching element is an SOA.

4. The optical switching matrix of Claim 1, wherein only one input can communicate data to a particular output in a switching time interval.

5. The optical switching matrix of Claim 1, wherein the optical switching matrix is operable to switch wavelength division multiplexed traffic.

6. The optical switching matrix of Claim 1, further comprising an optical receiver operable to filter and amplify signals arriving at the optical switching matrix.

7. The optical switching matrix of Claim 1, further comprising an optical transmitter operable to filter and amplify signals leaving the optical switching matrix.

8. The optical switching matrix of Claim 1, further comprising:

a packet scheduler that establishes a schedule pattern for the optical switching matrix;

a switch controller in communication with the packet scheduler operable to configure the optical switching matrix according to the schedule pattern; and

a plurality of switch links connecting the switch controller to each of the plurality of path switches, wherein the switch links communicate signals from the switch controller to the path switches to open or close the path switches according to the schedule pattern.

9. The optical switching matrix of Claim 8, wherein the packet scheduler is further operable to schedule multiplexing of data packets.

10. The optical switching matrix of Claim 1, wherein each input intersects with each output.

11. An optical switching core comprising:

a plurality of switching matrices, each switching matrix further comprising:

a plurality of inputs;

a plurality of outputs, wherein at least one input at a switching matrix intersects with at least one output at the switching matrix; and

a plurality of path switches, wherein a path switch is located at each intersection between an input and an output and wherein the path switch at each intersection is operable to communicate data from the intersecting input to the intersecting output, and

a plurality of cross links linking each of the plurality of switching matrices to at least one other switching matrix.

12. The optical switching core of Claim 11, wherein each path switch is associated with a different switching element.

13. The optical switching core of Claim 12, wherein each switching element is an SOA.

14. The optical switching core of Claim 11, wherein data traffic can be routed from one switching matrix to another switching matrix via at least one cross link from the plurality of cross links.

15. The optical switching core of Claim 11, wherein only one input can communicate data to a particular output in a switching time interval.

16. The optical switching core of Claim 11, wherein the optical switching core is operable to switch wavelength division multiplexed traffic.

17. The optical switching core of Claim 11, further comprising an optical receiver operable to filter and amplify signals arriving at the optical switching core.

18. The optical switching core of Claim 11, further comprising an optical transmitter operable to filter and amplify signals leaving the optical switching core.

19. The optical switching core of Claim 11, further comprising:

a packet scheduler that establishes a schedule pattern for the optical switching core;

a switch controller in communication with the packet scheduler operable to configure the optical switching core according to the schedule pattern; and

a plurality of switch links connecting the switch controller to each of the plurality of path switches, wherein the switch links communicate signals from the switch controller to the path switches to open or close the path switches according to the schedule pattern.

20. The optical switching core of Claim 11, wherein the packet scheduler is further operable to schedule multiplexing of data packets.

21. The optical switching core of Claim 11, wherein each input intersects with each output.

22. An optical cross-bar switch comprising:

a plurality of input links;

a plurality of output links;

a plurality of switching elements, each switching element further comprising a plurality of path switches connecting at least one of the plurality of input links to at least one of the plurality of output links; and

wherein the plurality switching elements are configured to create a plurality of unique paths through the optical cross-bar switch.

23. The optical cross-bar switch of Claim 22, wherein the switching elements are N to 1 switching elements, where N is equal to the number of the plurality of input links, for switching data packets received on any of the N input links to one of the plurality of output links.

24. The optical cross-bar switch of Claim 23, wherein each of the N to 1 switching elements comprises an N to 1 semiconductor optical amplifier.

25. The optical cross-bar switch of Claim 24, wherein only one input link at each of the plurality of switching elements can communicate data to the one output link at each of the plurality of switching elements during a switching time interval.

26. The optical cross-bar switch of Claim 22, wherein the optical cross-bar switch is operable to switch wavelength division multiplexed data packets.

273. The optical cross-bar switch of Claim 22, wherein there is at least one output link for each input link.

28. The optical cross-bar switch of Claim 22, wherein each switching element has sufficient bandwidth to accommodate all the wavelengths upon which data packets are transported.

29. The optical cross-bar switch of Claim 22, further comprising an optical receiver configured to filter and amplify incoming signals.

30. The optical cross-bar switch of Claim 22, further comprising an optical transmitter operable to filter and amplify outgoing signals.

31. The optical cross-bar switch of Claim 22, further comprising:

a packet scheduler that establishes a schedule pattern for the optical cross-bar switch;

a switch controller in communication with the packet scheduler operable to configure the optical cross-bar switch according to the schedule pattern; and

a plurality of switch links connecting the switch controller to each of the switching elements, wherein the switch links communicate signals from the switch controller to the switching elements to open or close the plurality of path switches according to the schedule pattern.

32. The optical cross-bar switch of Claim 31, wherein the packet scheduler is further operable to schedule multiplexing of data packets.

33. The optical cross-bar switch of Claim 22, wherein the switching elements are N to M switching elements, where N is equal to the number of the plurality of input links and M is equal to the number of the plurality of output links, for switching data packets received on any of the N input links to any of the M output links.

34. The optical cross-bar switch of Claim 22, wherein the switching elements are 1 to M switching elements, where M is equal to the number of the plurality of output links, for switching data packets received on any one of the input links to any of the M output links.

35. An optical switch for providing a concurrent unique switch path from any of a plurality of input links to any of a plurality of output links comprising:

an array of N to 1 switching elements, where N is equal to the number of the plurality of input links, each switching element further comprising a plurality of path switches connecting each of the N input links to one output link; and

wherein the plurality of switching elements are configurable to create a plurality of unique paths through the optical cross-bar switch.

36. The optical switch of Claim 35, wherein each switching element is a semiconductor optical amplifier.

37. The optical switch of Claim 35, wherein only one input link at each switching element can transfer data packets to the one output link at each switching element during a switching time interval.

38. The optical switch of Claim 35, wherein the optical switch is operable to switch wavelength division multiplexed data traffic.

39. The optical switch of Claim 35, wherein there are at least N switching elements.

40. The optical switch of Claim 35, wherein each switching element has sufficient bandwidth to accommodate all the wavelengths upon which data packets are transported.

41. The optical switch of Claim 35, further comprising an optical receiver coupled to each of the plurality of input links, wherein the optical receiver is operable to filter and amplify incoming signals.

42. The optical switch of Claim 35, further comprising an optical transmitter coupled to each of the plurality of output links, wherein the optical transmitter is operable to filter and amplify outgoing signals.

43. The optical switch of Claim 35, further comprising:

a packet scheduler that establishes a schedule pattern for the optical switch;

a switch controller in communication with the packet scheduler operable to configure the optical switch according to the schedule pattern; and

a plurality of switch links connecting the switch controller to each of the switching elements, wherein the switch links communicate signals from the switch controller to the switching elements to open or close the path switches according to the schedule.

44. The optical switch of Claim 43, wherein the packet scheduler is further operable to schedule multiplexing of data packets.

45. An optical router comprising:

a plurality of ingress edge units;

a plurality of egress edge units;

an optical switch core further comprising:

an optical switching matrix further comprising:

a plurality of inputs;

a plurality of outputs, wherein at least one input intersects with at least one output;

a plurality of path switches with at least one path switch at each intersection between an input and an output operable to communicate data from the intersecting input to the intersecting output, wherein the plurality of path switches is configurable to create a plurality of unique paths through the optical switching matrix;

a core controller further comprising:

a packet scheduler that establishes a schedule pattern for the optical switching matrix;

a switch controller in communication with the packet scheduler operable to configure the optical switching matrix according to the schedule pattern; and

a plurality of switch links connecting the switch controller to each of the path switches, wherein the switch links communicate signals from the switch controller to the path switches to open or close the path switches according to the schedule pattern.

46. The optical router of Claim 45, wherein the optical switching matrix is operable to:

receive a plurality of data packets from each of the plurality of ingress edge units, wherein each data packet is bound for an associated destination egress edge unit; and

route each of the data packets to the data packet's associated destination egress edge unit according to the plurality of unique paths.

47. The optical router of Claim 45, wherein the packet scheduler is further operable to schedule multiplexing of data packets at each of the ingress edge units such that data packets bound for the same egress edge unit are multiplexed together into sets of multiplexed data packets.

48. The optical router of Claim 47, wherein the packet scheduler is further operable to schedule the transmission of the sets of multiplexed data packets from each ingress edge unit so that only one set of multiplexed data packets destined for a particular egress edge unit arrives at the optical switching matrix in a switching time interval.

49. The optical router of Claim 45, wherein the packet scheduler monitors the plurality of ingress edge units to determine a transmission pattern for each of the plurality of ingress edge units, wherein the transmission pattern prompts each ingress edge unit to transmit super packets to the optical switching matrix so that no two super packets destined for the same egress edge unit arrive at the optical switching matrix in a switching time interval.

50. The optical router of Claim 45, further comprising a plurality of switching elements connecting the inputs to the outputs.

51. The optical router of Claim 50, wherein the switching elements are N to 1 switching elements, where N is equal to the number of the plurality of inputs, for switching data packets received on any of the N inputs to one of the plurality of outputs.

52. The optical router of Claim 51, wherein each of the N to 1 the switching elements comprises an N to 1 semiconductor optical amplifier.

53. The optical router of Claim 50, wherein there is at least one output for each input.

54. The optical router of Claim 50, wherein each switching element has sufficient bandwidth to accommodate all the wavelengths upon which data packets are transported.

55. The optical router of Claim 45, wherein the optical switch core further comprises an optical receiver configured to filter and amplify incoming signals.

56. The optical router of Claim 45, wherein the optical switch core further comprises an optical transmitter operable to filter and amplify outgoing signals.

57. A method of routing optical data packets comprising:

receiving a data packet on an input;

configuring an optical switching matrix to create a plurality of unique paths through the optical switching matrix;

routing the data packet to an output according to a unique path from the plurality of unique paths.

58. The method of Claim 57, further comprising:

receiving a plurality of data packets via a plurality of inputs;

routing the data packets to a plurality of outputs according to the plurality of unique paths.

59. The method of Claim 58, wherein the step of receiving a plurality of data packets further comprises receiving a single data packet on each of the plurality of inputs in a switching time interval.

60. The method of Claim 58, wherein each of the plurality of inputs is connected to a different one of a plurality of ingress edge units.

61. The method of Claim 58, further comprising routing each single data packet to a different one of the plurality of outputs according to the plurality of unique paths.

62. The method of Claim 61, wherein each of the plurality of outputs is connected to a different one of a plurality of egress edge units.

63. The method of Claim 58, wherein the step of receiving a plurality of data packets further comprises receiving a set of data packets on each of the plurality of input links in a switching time interval, wherein each data packet in an associated set of data packets has the same destination egress edge unit.

64. The method of Claim 63, further comprising routing each set of data packets to a different output link according to the plurality of unique paths.

65. The method of Claim 63, wherein each set of data packets further comprises a super packet.

66. The method of Claim 63, wherein each set of data packets further comprises a set of wavelength division multiplexed data packets.

67. The method of Claim 63 further comprising determining a transmission pattern for each of a plurality of ingress edge units linked to the optical switching matrix, wherein the transmission pattern prompts each ingress edge unit to transmit a different set of data packets to the optical switching matrix so that no two sets of data packets destined for the same egress edge unit from a plurality of egress edge units arrive at the optical switching matrix in a switching time interval.

68. The method of Claim 57, further comprising multicasting the data packet arriving at the input to a plurality of outputs.